Missouri Resources

Spring 2014 • Volume 31 • Number 2

40 years

Missouri Department of Natural Resources

director's comment

"The ultimate test of man's conscience may be his willingness to sacrifice something today for future generations whose words of thanks will not be heard."

- Gaylord Nelson, *former governor and U.S. Senator from Wisconsin, founder of Earth Day.*

Nelson created the first Earth Day on April 22, 1970 as a means to increase environmental awareness across the country. Our natural resources were polluted and the beauty of this great nation began to diminish.

Nelson's quest to improve our environment was difficult at times; however, he believed the ends justify the means and the nation realized it was for the greater good. Protection of natural resources is one area among many where the public has said government should have a role … because our natural resources belong to all of us, and every single one of us depends upon these resources for our very life and livelihood.

We've had to make a few sacrifices along the way in order to improve and care for these precious resources. The remarkable success of Earth Day and environmental protection grew from the seed Sen. Nelson planted back in 1970 and has continued to grow and flourish to this day.

Missouri has come a long way since we celebrated the first Earth Day and since the Department of Natural Resources was created 40 years ago. We have continued to learn how to improve environmental protection using new technologies and through better understanding and increased citizen input.

Earth Day, as well as the department's 40th anniversary, provides us with an opportunity to reflect and focus on what we can do as individuals, communities, businesses and agencies to care for our natural resources. It's also a time to give thanks to those who came before us, and who made numerous sacrifices to ensure our states' invaluable natural resources will continue to provide a valuable quality of life for future generations of Missourians.

Learn more about the department's 40th anniversary at dnr.mo.gov/40.

Sara Parker Pauley

Sara Parker Pauley
Missouri Department of Natural Resources

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Mission Statement
The mission of the Missouri Department of Natural Resources is to protect, preserve and enhance Missouri's natural, cultural and energy resources.

MISSOURI RESOURCES is published quarterly by the Missouri Department of Natural Resources to inform readers about important natural resource issues and how they are being addressed. Any correspondence should be directed to the editor at the Department of Natural Resources, Publications, PO Box 176, Jefferson City, MO 65102-0176, or call 800-361-4827. Email address: moresdnr@dnr.mo.gov. MoDNR home page: dnr.mo.gov. To subscribe or unsubscribe online: dnr.mo.gov/magazine/subscription.htm.

Additional content available for this story – go to dnr.mo.gov/education.

MISSOURI RESOURCES is available in alternative formats.

Missouri Resources is printed with soy ink on recycled paper at Walsworth Publishing Co., Marceline, Mo.

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MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

40 years
Missouri Department of Natural Resources

Above: Kayaking on Stockton State Park's water trail is a great way to explore the park's bluff-lined shore and quiet coves.
Front Cover: An Ostrich Fern rises from the forest floor at Hawn State Park. The unfurled, insect-like top of the young fern is called a "fiddlehead."
Back Cover: Campers enjoy the shade and a lakefront view while staying at Lake of the Ozarks State Park.
DNR photos by Scott Myers

Off-Road Tires

Keeping Missouri free from scrap tire dumps

by Dee Goss

DNR photo by Richard Allen

Among Dan Fester's first memories of inspecting an illegal tire dump was the fog – a fog not from the weather but from the millions of swarming mosquitoes.

By the end of his day, Fester, chief of the Missouri Department of Natural Resources' scrap tire and illegal dumping unit, looked as though he'd entered a hornet's nest, rather than a scrap tire dump.

"The first one I clearly remember was a dump containing around 4 million tires," Fester said of the 15-acre site in central Missouri. "Acres of tires piled up to nearly 25 feet tall created a maze, blocking out the landscape and making it difficult to tell

DNR photo by Don Van Dyke

(Opposite page) Before a scrap tire cleanup, the ground is polluted, water is murky, and surrounding foliage is dying.
(Above) After cleanup the environment begins its return to health as water begins to clear.
(Below) Products made of scrap tires, such as this rubber mulch, are an effective substitute for wooden products. Materials made of recycled scrap tires do not attract mold, fungus or insects such as termites and ants. It will not fade or rot and is five times heavier than traditional mulch, so it will not float or blow away during heavy rain or wind.

where you were … yeah, I'd say there was a problem."

Battling illegal tire dumps requires the Department of Natural Resources to address both the cleanup of existing sites and prevention of future sites. Such tire dumps pose threats to both human health and the environment, Fester said.

"Mosquitoes, snakes, spiders, bugs, skunks and other vermin love living in scrap tire dumps," Fester said. "Mosquitoes, in particular, are able to multiply quickly and thrive within the folds and crevices of piled up scrap tires, which allow for their breeding season to be extended from the heat retained in the tires. Mosquitoes appreciate and breed in the stagnate water col-

Michael Sebastian photo

DNR file photo

A scrap tire fire sends toxic smoke into the air and hazardous oily runoff into waterways.

lected in the inner rings. Snakes like to burrow under them as these insect eaters are treated to an all-you-can-eat buffet."

Tire fires, which grow in likelihood with the number and size of illegal dumps, also threaten human health and the environment with their toxic smoke and oily runoff produced by the fire. These nasty byproducts must be cleaned up after a tire fire to prevent permanent environmental damage to the land and nearby surface waters, as well as long-term impacts to groundwater.

Massive tire dumps like the one Fester described once dotted Missouri's countryside, with neither the state nor local municipalities having the resources to address a problem decades in the making. However, in 1990 citizens and legislators joined together to support the creation of a scrap tire fee that would support a safe disposal pathway for millions of scrap tires generated each year. This pathway includes recycling, repurposing and preparing them for proper disposal that will neither contribute to nor create pest issues.

The funds generated by the fee since 1990 have helped support the removal of nearly 17 million scrap tires found in illegal dumps across Missouri.

One key to keeping scrap tires out of landfills – both legal and illegal – is to find some other place for them. A portion of the fee is used for grants aimed at helping build a market for products made from recycled tires. Many of these recycled tire products can be found at the local playground, including mats, custom pour-in-place surfaces and shredded tire material. Crumb rubber also can be used as cushioning on playgrounds, running tracks and athletic fields, helping reduce the number and severity of recreation-related injuries.

In addition to playground materials, recycled tires also are used to make rubber modified asphalt, picnic tables, guard rail bumpers and livestock mats.

Not all reuses result in consumer products. Waste Corporation of Missouri is using scrap tire chips to filter the liquids that collect and leach from two of its municipal waste landfills. Kansas City Power &

Light uses tires mixed with coal as fuel at two of its Missouri power plants. This tire-derived fuel helps the utility reduce its coal use.

More than 20 years of cleanups, local grants and market development have combined to remove the state's massive dump sites, with the department focusing its remaining cleanup and enforcement efforts on smaller sites. Although the situation is being managed, a 20-month lapse in the funding of the scrap tire program between 2004 and 2005 illustrates just how quickly the problem could once again get out of hand, Fester said.

"Without enforcement, during this time, the department estimated nearly 500,000 tires were illegally dumped," he said. With Missourians generating nearly 6 million scrap tires per year, it would not take long before the state would once again find itself being run over by scrap tires.

However, as long as the department's scrap tire program continues its work, any fog in Missouri's forecast will likely be weather related – and not mosquitoes.

Dee Goss is a public information specialist serving the Department of Natural Resources' Solid Waste Management and Hazardous Waste Management programs.

DNR photo by Dee Goss

DNR photo by Dee Goss

(Above right) Recycled scrap tires can be formed into padded playground mats, allowing children to play while lowering the risk of injury from falls.
(Right) While visiting the Missouri State Fair, many attractive, splinter-free picnic tables and benches made from recycled scrap tires are available for visitors' use.

Water's Journey

The Drinking Water Cycle

by John Fraga and Ken Tomlin

DNR photo by Scott Myers

Claps of thunder and flashes of lightning announce the coming rain. Carefully tended fields with terraces capture and absorb the falling rain. Across the valley, though, the hills appear scarred with irregular and muddy paths as the rainfall creates its own channels and flows down towards the gullies and ditches below. Along the historic city streets of St. Joseph, stormwater cascades in sheets toward the storm drains and sewers, following its designed path and picking up whatever dirt and debris that accumulated since the last downpour. The runoff follows its downward course to the Missouri River and beyond.

This scene, although it could depict a storm almost anywhere in Missouri, is what greets visitors as they first walk through a new, permanent exhibit at the Remington Nature Center of St. Joseph.

As rain falls over an artful rendition of St. Joseph and the surrounding watershed, visitors can follow the path water takes as it flows to the river and the saturated sands that line its banks. Turn a few levers and you'll learn some facts about the Missouri River from jumping fish.

Next, follow the path of water as it is drawn through alluvial wells into the treatment facility where it undergoes coagulation, sedimentation and filtration – all in front of your eyes. Watch as the treated water flows up and back down through a water tower before being channeled through the distribution system towards St. Joseph residents.

The Remington Nature Center in St. Joseph aims to share nature's wonder with students and families, children and adults.

DNR photo by Scott Myers

"This interactive display shows the journey of water as it travels from a source to the tap. It answers the question of how we get our drinking water and the answer is delivered in a fun and unique way ... and the entire walk-through display includes running water," said Andrea George, manager of the nature center.

Modeled after the drinking water treatment system used by Missouri American Water to serve St. Joseph, "Water's Journey" offers a tour of the drinking water cycle and an interactive experience that reinforces the concept of watershed and source water protection.

DNR photo by Scott Myers

Designed as an educational component of St. Joseph's source water protection plan, Water's Journey highlights the value of protecting water resources and the power of collaboration. The Missouri River and its saturated alluvial aquifer is a primary source of drinking water for as many as 1.8 million Missourians.

"The city is excited about the Remington Nature Center and the Water's Journey project," said Andrew Clements, assistant director of Public Works and Transportation for St. Joseph. "It reinforces the importance of the Missouri River and its influence on our communities and helps to promote awareness of what a valuable resource it is for drinking water."

Producing an interactive, technical and accurate exhibit requires partnership and collaboration. "This display is the first of its kind in Missouri and the first time American Water has embarked on a collaboration of this kind," said Frank Kartmann, president of Missouri American Water. "With the contributions of the City of St. Joe and the Missouri Department of Natural Resources, we believe Water's Journey will set a new standard for water-themed educational displays."

Water's Journey was funded by Missouri American Water, the City of St. Joseph and a source water protection grant from the Department of Natural Resources.

Protecting the sources of drinking water in Missouri is the goal of the department's Source Water Protection Program, a voluntary program that provides technical and financial assistance to public water systems and communities in Missouri to protect their drinking water sources. Participation in the program is voluntary on the part of water systems, but collaborative efforts such as St. Joseph's are essential in protecting a drinking water source as vast as the Missouri River. Communities interested in the Missouri Source Water Protection Program should contact the department's Public Drinking Water Branch at 573-751-1300.

Overlooking the real Missouri River, the Water's Journey display is just one of many outstanding educational exhibits at the Remington Nature Center, a facility owned by St. Joseph and operated by the city's Parks and Recreation Department. For additional information about the center and the Water's Journey exhibit, please visit the center at 1502 MacArthur Drive in St. Joseph, go to stjoenaturecenter.info or call 816-271-5499.

John Fraga and Ken Tomlin both work in the Department of Natural Resources' public drinking water compliance and enforcement unit. Tomlin also is the source water assessment and protection coordinator.

Portraits by Long photo

(Opposite page top) An interactive display at the Remington Nature Center shows the journey of water as it flows from its source to the tap.
(Top) The Water's Journey exhibit helps to promote awareness of the importance of the Missouri River as a valuable source of drinking water.
(Above) Visitors experience a walk-through that features interpretive displays, demonstrating the drinking water cycle.

(Above) Learn2 staff help tackle one of the first tasks of the day by assisting campers as they set up tents at their campsites. (Right) Learning about dutch oven cooking and helping to make a tasty dessert are just a couple of the experiences campers have during the Learn2 camps. (Opposite page) Camp participants learn from park staff about properly respecting wildlife while camping.

DNR photos by Scott Myers

DNR photo by Christy Pick

Learn2!

Never camped? Never paddled? Never fear.

by Tom Uhlenbrock

Enjoying the outdoors is the goal of the Learn2 programs offered by Missouri State Parks, a division of the Department of Natural Resources, at sites throughout the state.

The staff at participating parks offer training on camping, paddling and other activities, with the programs tailored for individuals and families with little or no experience in the outdoors. Often, parents' only real experience is what they "learned" as a child on family outings. As adult mentors, they realize those experiences often require specialized skills.

"If they've never done it before, we show them how," said Steve Bost, the interpretive resource specialist at Montauk State Park near Salem, which offers Learn2 Camp programs at its campgrounds along the Current River.

Tents, stoves, kitchen kits, sleeping pads and other camping equipment are provided for the weekend through a partnership with The North Face under its "Explore Your Parks" program, which is active in more than a dozen states.

In addition to loaning equipment, the program gives campers an activity guide with information on hiking, biking, camping, paddling and playing in parks close to metropolitan areas.

Participants also receive an "Outdoor Exploration Guide: Camping 101" that has a camper gear checklist, Leave No Trace principles, outdoor cooking recipes, hiking information and a safety checklist and activities for kids.

Participants apply online at mostateparks.com and are asked to write why they should be considered for a Learn2 program.

Campers pay $13, which is the same as the basic state park camping fee, and in return receive a coupon for their next

camping trip to a Missouri park. Upon completion of the program, participants receive a discount coupon good at The North Face store locations.

The first day begins with setting up camp and ends with s'mores around the campfire. Park staff are present to answer any questions.

"We show them how to set up a tent, how to arrange a campsite," Bost said. "They learn different techniques for building a fire, how to build a fire when it's raining, and how to cook on an open fire."

Bost conducts nature talks and leads hikes. His advice ranges from simple topics, like hiking safety, to more complicated subjects like how to hook a tasty trout.

Trail maps are distributed so the participants can enjoy the park, and the program ends with campsite cleanup and equipment packing.

The participants then are free to

> “They learn different techniques for building a fire, how to build a fire when it’s raining, and how to cook on an open fire.”
>
> – Steve Bost, interpretive resource specialist, Montauk State Park

spend their last day exploring the park, and practicing what they have learned.

“Knowledge is real important,” said Bost. “We want to make their camping trip more enjoyable, so they can have a good time in the outdoors.

“They all said the same thing, hands down, that they were definitely going to come back again. They left with big smiles on their faces.”

During 2013, there were 77 people who participated in the Learn2 Camp programs at five state parks. Sessions were held at Robertsville, Trail of Tears, Montauk and Weston Bend state parks and Arrow Rock State Historic Site.

Learn2 Paddle programs allow visitors to learn more about kayaking in Missouri State Parks. In 2013, 272 people signed up for

(Opposite page, top) Campers also have a chance to enjoy the campfire staple, s’mores.
(Opposite page, bottom) During a Learn2 camp at Weston Bend State Park, campers enjoy a program focused on enjoying the night sky.
(Above) Fire building and outdoor cooking are just two of the essential skills needed for camping outdoors. Both are taught during the Learn2 Camp.
(Left) Hands-on experience is one of the main approaches that Learn2 staff take when teaching.
DNR photos by Scott Myers.

DNR photo by Scott Myers

(Above) Paddling is taught during the Learn2 Paddle program at Wakonda State Park's 160-acre Agate Lake. (Below) Campers learn about some of the wonders of the outdoors during an afternoon demonstration at Weston Bend State Park.

DNR photo by Scott Myers

DNR photo by Scott Myers

Learn2 staff introduce participants to the basics of camping and serve as guides throughout the experience.

classes in six state parks. The parks with Learn2 Paddle programs were Wappapello, Crowder, Cuivre River, Wakonda, Stockton and Finger Lakes. The programs are free, and reservations are required.

Kyle Scott, the natural resource manager at Wakonda State Park, has taught Learn2 Paddle sessions the past two summers. The park in the northeast corner of the state features six lakes that make it perfect for water recreation. Paddling sessions are taught on the 160-acre Agate Lake. The park has its own kayaks, paddles and floatation vests that are loaned to participants.

"We had three sessions each day, with an average of eight to 10 people per session, with two instructors," Scott said. "It starts on dry land. We go over the parts of a kayak, different types of kayaks and paddles, and how to properly use safety devices, like floatation vests."

Scott and the other instructors at the park received certification training on flat-water kayaking from the American Canoe Association. Wakonda State Park has a rental fleet of sit-on-top kayaks, where the floater sits on an open seat of molded plastic rather than enclosed in a cockpit.

"Once we familiarize everybody with the kayaks, we put them in the water and go over a few strokes, then basically do a tour out onto the lake," Scott said. "We give them the opportunity to flip the kayaks over and do a re-entry, if they want to do that."

The occasional mishap is expected, but not a problem in the calm water of the shallow lake, Scott said.

"I had a lady one year who was terrified," he said. "I told her how hard it was to flip over the kayak. She got in and flipped it right over. But she was three feet from the bank, and got right back in and had a really good time."

Six Girl Scouts from Troop 5189 took part in a Learn2 Paddle session last July at Wakonda and "had a blast," said their leader, Gail Mast.

"The park ranger was a lot of fun," Mast said of Kyle Scott. "He taught them safety, they went out on the water, and stopped and swam at a beach for a little while. Kyle was laid back and allowed them just to have a good time with it.

"A couple of dads and a few brothers also took the class with them. They all learned a ton. If anybody dumped, they dumped on purpose."

For more information on the Learn2 series held in Missouri state parks and historic sites, visit mostateparks.com.

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

MISSOURI GEOLOGICAL SURVEY

Earth science for everyone

by Carey Bridges photographs by Scott Myers

A wealth of earth science information for Missouri dating back to the mid-1800s is available from the Missouri Geological Survey, a division of the Missouri Department of Natural Resources.

Documenting, preserving and maintaining geologic information and specimens is critical for understanding Missouri's resources and developing strategies for a sustainable future. Due in part to the longevity of the Missouri Geological Survey and expertise of its staff, the state survey is a valuable source of natural resource information, including occurrence, location, quantity and quality of the resources that lie beneath our feet and provide for Missouri's health, economy and recreation.

(Above) This box of rock core contains magnetite (iron ore) from Pilot Knob and was donated by John Nold, Ph.D., professor emeritus, University of Central Missouri. The McCracken Core Library and Research Center is one of the largest collections of core samples in the nation.

(Left) Ninteenth-century notebooks used by geologists, now available electronically, include drawings, maps, information and observations about Missouri geology and related topics.

McCracken Core Library and Research Center

Since 1989, the Missouri Geological Survey has managed the McCracken Core Library and Research Center, named in honor of geologists Earl and Mary McCracken, whose service to the state survey spanned more than three decades. The 21,000-square-foot facility located in Rolla houses nearly 3,000 drill core samples containing more than two million linear feet of exploration rock cores and cuttings with an estimated replacement value of $100 million.

Cores are cylindrical sections of solid rock obtained by using a hollow-core drill. Drilling may be to depths of 1,000 feet or more. Most of the core is 1⅜ inches in diameter and stored in 2-foot sections. Cuttings are broken pieces of rock obtained as a drill bit advances below the surface.

Core research preserves geological information, leads to a better understanding of subsurface geology, hydrology, water resources and economic geology potential. It yields data useful in solving environmental, industrial and engineering problems. Core available for study comes from many sources throughout Missouri, including highway department construction, oil, gas and mineral exploration drilling, quarries and various subsurface investigations related to landfills and hazardous waste sites.

The center is widely used by industry, consultants, scientists, academia, government representatives and the public to ac-

(Above) Pat Mulvany, Ph.D., Industrial Materials unit chief, uses a stereoscope to view a pair of aerial photographs as a 3-D image. Photographs such as these are used to verify locations of geologic features and to examine changes over time. (Left) Carey Bridges, director of the department's Geological Survey Program, and Cheryl Seeger, Ph.D., Geologic Investigations unit chief, view maps from the state map repository. The repository was established by the state legislature in 1993.

(Above) The Greene Geology Library contains 100,000 aerial photographs used to examine geologic features. (Below) Patrick Scheel, facility operator of the McCracken Core Library and Research Center, uses a core saw to cut rock core that will be used by a customer to conduct research.

cess subsurface information without the costly need to drill new boreholes. This leads to savings of millions of dollars in exploratory costs each year.

"The McCracken Core Library and Research Center is an invaluable asset to the state of Missouri. The historical core allows university researchers to investigate efficient ways to improve the environment for all Missourians," said Doug Gouzie, Ph.D. and associate professor of geology, Missouri State University in Springfield. "Our research team participated in the Missouri Carbon Sequestration Project, during which Missouri Geological Survey staff received and managed the rock core from the three deep boreholes across the state. The well-catalogued core and knowledgeable staff allowed us to make optimal use of our time to examine core in microscopic detail. As a result, we were able to minimize the amount of new drill core needed and improve our understanding of the St. Francois Aquifer … in southwest Missouri," explained Gouzie.

Carbon capture and sequestration is a set of technologies that potentially can reduce CO_2, methane, nitrous oxide and other gas emissions from coal- and gas-fired power plants and large industrial, agricultural and transportation sources.

"The McCracken Core Library and Research Center is of critical importance to the current U.S. Geological Survey Project on Setting and Origin of Iron Oxide-Copper-Cobalt-Gold-Rare Earth Element Deposits of southeast Missouri," said John Slack, a geologist at the U.S. Geological

Survey in Denver. “Many key samples for geochemistry, isotopes, fluid inclusions, and geochronology analyses came from drill cores stored at the facility.”

The St. Francois Mountains region likely has the highest potential for undiscovered large rare earth element deposits in the contiguous United States. Rare earth elements hold vast potential for business, energy and defense technologies.

The center is one of the largest public core repositories in the U.S. You can learn more about the McCracken Core Library and Research Center, and see a list of holdings at dnr.mo.gov/geology/geosrv/geores/mccracken.htm.

Frank C. Greene Geology Library

The Missouri Geological Survey also maintains the Frank C. Greene Geology Library, a technical library at the main offices of the survey in Rolla. The library, named after renowned survey geologist Frank C. Greene, contains thousands of published and unpublished technical books, journals, periodicals, maps and manuscripts. Historic field notebooks and photos about Missouri’s geology, including mineral, energy and water resources also are available for public review.

“Library holdings include everything that has been published by the survey, beginning in 1855 when the “First and Second Reports” volume of the survey was printed,” said Joe Gillman, state geologist and director of the Missouri Geological Survey.

The library also contains bound sets of major geology journals, publications of state geological surveys that are contiguous with Missouri, publications of the U.S. Geological Survey and aerial photographs of the Missouri landscape dating back to 1938. Missouri’s State Mine Map Repository and related geo-referenced digital imagery also are part of the holdings.

Many of the manuscripts are deemed one-of-a-kind or rare. Rare and old items are maintained in a climate-controlled environment adjacent to the main physical library.

“Since 2007, the library has been gradually converted into a digital library to meet the demands of consumers,” said Pat Mulvany, a geologist at the Missouri Geological Survey. “At this time, all survey publications and maps dating back to 1855 have been scanned and included in the digital library.”

Library holdings, paper and digital, are indicated by the survey’s online Missouri Geology Bibliography at dnr.mo.gov/asp/dgls/bibliography/search.asp and by its online Missouri Geologic Map Index at dnr.mo.gov/geology/statemap/missouri-maps.htm.

Much of the information in the library exists nowhere else and is a vital resource for researching the geology of Missouri. Visitors may review original materials, and paper or digital versions of library holdings are available for purchase.

Access and tours of both facilities by interested parties are available by appointment by calling 573-368-2100.

Carey Bridges is director of the Geological Survey Program, Missouri Geological Survey, a division of the Missouri Department of Natural Resources.

Patrick Scheel pulls a box of core samples for examination. Core sample research leads to a better understanding of resources and yields data useful in solving environmental, industrial and engineering problems.

DNR photo by Tom Uhlenbrock

Bridging Our History

Missouri's four historic covered bridges

by Tom Uhlenbrock

GOLDMAN, Mo. – Bring on the brides. The Sandy Creek Covered Bridge has been restored to its picturesque beauty and once again will be a highly sought after location for wedding photography.

The bridge spans lovely Sandy Creek in northeast Jefferson County at the southern tip of the St. Louis metropolitan area. It was built in 1884 by John Hathaway Morse and carried traffic until 1984.

The Sandy Creek Covered Bridge State Historic Site preserves one of Missouri's four remaining historic covered bridges. From the 1820s to the turn of the century, there were some 30 covered bridges scattered across the state. They were replaced over the years by iron bridges that could handle the heavier traffic.

The four that remain are architectural artifacts from a period in American history when travel, and life, moved at a slower pace. Today, they stand like wood

DNR photo by Tom Uhlenbrock

(Top) A work crew puts the finishing touches on the restoration of the Sandy Creek Covered Bridge State Historic Site.
(Above) An unusual feature of Union Covered Bridge is its horizontal siding, similar to that on a home exterior. Missouri's other three historic bridges have vertical planking, like a barn.

DNR photo by Christie Pick

(Left) Locust Creek Covered Bridge used to take travelers over Locust Creek. The bridge was bypassed when the creek was channelized for agriculture.
(Bottom) The Burfordville Covered Bridge at Bollinger Mill State Historic Site was completed around 1868. It is the oldest of Missouri's remaining covered bridges.

sculptures in quiet, serene settings for visitors on foot to admire the craftsmanship of their heavy wood-beam structure.

Last summer, the Missouri Department of Natural Resources completed a restoration program of the Sandy Creek bridge that cleaned its wood beams, replaced the white pine siding and gave the bridge a new coat of its original barn-red paint.

The Union Covered Bridge State Historic Site in Monroe County in northeast Missouri is unique among the state's covered bridges because it has a double Burr-arch truss of curving wood for structural strength. The siding also is horizontal, like many houses, while the others have vertical planking, like some barns.

The bridge was built in 1871, and had an extensive restoration in 1987. It carried vehicles on the Paris-to-Fayette road for 99 years.

The Locust Creek Covered Bridge State Historic Site, built in 1868 in Linn County, used to cross Locust Creek, before the creek was channelized for agriculture. A footbridge now goes over the creek, and a quarter-mile walk through the bottomland forest ends at the covered bridge, which sits high and dry in the woods. At nearby Pershing State Park, Locust Creek maintains its natural meanders and feeds a rare remnant of wet prairie.

The Burfordville Covered Bridge in Cape Girardeau County in southeast Missouri is the oldest of the four bridges. It is part of the Bollinger Mill State Historic Site. The bridge, which was completed in 1868, stands next to the stately four-story, brick-and-stone mill building on the Whitewater River in the little community of Burfordville.

The Burfordville Covered Bridge was once a money-maker. Tolls were charged to cross it, with a traveler on foot paying three cents. A horse, mule or ox was nine. A one-horse wagon was 37 cents. And crossing faster than a walk brought a fine of a dollar.

Consider taking a step back in time and visit Missouri's oldest covered bridges – preserved like historic wood sculptures. For more information, visit mostateparks.com.

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

DNR photo by Tom Uhlenbrock

Hazardous Cleanup Site Information Now Online

Missourians now can get details on hazardous substance cleanup sites anywhere in Missouri – from across the state to across the street – thanks to a new, web-based, interactive map developed by the Missouri Department of Natural Resources.

"Missouri residents have a right to know what's happening at cleanup sites in their communities," said Department of Natural Resources Director Sara Parker Pauley. "This mapping system puts those important details right at their fingertips."

The map, known as the Missouri Hazardous Substance Site Locator, allows users to search for information about cleanup sites within a specific community or area. This map includes site details such as contaminants, future property use restrictions and links to important documents. Downloadable data layers also are available. The map can be found online at dnr.mo.gov/molts/gov/.

Osage Beach Student Wins Slogan Contest

GO WITH THE FLOW

An Osage Beach student's suggestion to "go with the flow" won top honors in the Missouri Department of Natural Resources' Earth Day 2014 Slogan Contest.

Mallory Bartels, a fifth-grader at Camdenton R-3 Capstone Gifted Center, submitted the slogan, "Watersheds: Go with the flow, clean H_2O," based on DNR's 2014 Earth Day theme, "Watersheds."

Bartels will be honored on stage at Earth Day 2014, which will be held Friday, April 25th, on the south lawn of the Capitol in Jefferson City.

She also will receive a $50 gift card donated by Central Bank of Jefferson City. DNR received nearly 250 entries.

Earth Day 2014 is the 20th annual Earth Day event sponsored by the Department of Natural Resources. Between 1,000 and 2,000 students are expected to attend the event, which will include educational activities, contests and stage shows. For more information visit the Earth Day website at dnr.mo.gov/earthday/.

Urban Hazards Mapping

The Missouri Geological Survey (MGS), a division of the Missouri Department of Natural Resources, recently completed mapping of the geologic limitations and environmental vulnerability of the Poplar Bluff area. The map, produced at a 1:250,000 scale, identifies areas as potentially suited, or not suited, for the development of short- or long-term debris storage or solid waste disposal.

Time Exposures

Photo courtesy of Hoffman family

At the end of World War I, farming remained a labor-intensive process with many harvesting operations still carried out using horses. While not a new technological advancement, threshers made it easier to separate the grain and chaff and eliminated much of the tedious and time-consuming manual labor involved in the harvest. Before threshing machines, grain was separated by hand using flails. Many farmers pooled resources by purchasing such machinery together and shared the equipment and labor involved in its operation.

This photo of a threshing machine and crew was taken between 1915 and 1920 on rented farmland south of Canton. The young man driving the wagon is Stanley B. Hoffman. Stanley's father, George Hoffman, a German immigrant, is standing to his immediate left. The thresher was owned by a group of farmers who moved it from farm to farm and shared the work of each harvest.

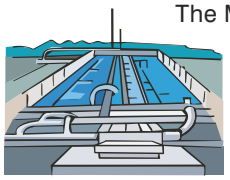
George Hoffman's family still lives in Canton on Century Farm, which was established in 1909.

Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1980 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that might be of interest to our readers.

Funded by the State Emergency Management Agency, this map gives local community planners and early responders the simple tools to make informed and timely decisions in the face of geologic hazards or other natural disasters, such as an earthquake or tornado, by identifying the geological suitability for development of short-term debris storage or long-term solid waste disposal.

Geologic limitations and environmental vulnerability were assessed by determining locations of faulting, shallow groundwater, groundwater aquifers, alluvial sediments, karst, solution-weathered bedrock and losing streams. MGS also developed a detailed GIS geodatabase for these geologic features in the Poplar Bluff area. During 2014, MGS is continuing this effort in the Farmington and Cape Girardeau areas. Maps are available at missourigeologystore.com.

Funding for Wastewater Engineering Assistance



The Missouri Department of Natural Resources is now accepting applications from communities with planning or design assistance needs for wastewater treatment and collection facilities.

The department's Small Community Engineering Assistance Grant Program is offering the grants to communities serving populations of less than 10,000. The goal of the program is to help small communities obtain wastewater engineering services necessary to plan and design wastewater treatment and collection facilities.

Funding from the Small Community Engineering Assistance Grant Program may be used to cover the costs of engineering services, environmental investigations or services incurred in preparation of a facility plan. Applications are prioritized based on when they are received, as well as on the project's environmental impact.

Eligible communities may be selected to receive up to $50,000. Applications will be accepted at any time, or until funds are depleted. Additional information is available from the department's Water Protection Program at dnr.mo.gov/env/wpp/.

Stream Team Notes

25 Days of Stream Team

McDonald County High School, Stream Team #1351

So, what can citizens who are passionate about Missouri's streams accomplish in 25 years? How about stenciling more than 17,000 storm drains, conducting over 25,000 water quality monitoring trips, planting over 250,000 trees, or picking up more than 20 million pounds of trash? That is exactly what the volunteer members of Missouri Stream Team have accomplished since the program's inception in 1989. We think that's worth a celebration!

Join us for "25 Days of Stream Team" with more than 25 special events happening all over the Show-Me State from March through October. We'll be highlighting the people and activities that have made Missouri Stream Team such a success over the past 25 years and give all Missourians the chance to participate in celebrating this unique Missouri treasure. Check out the "25 Days of Stream Team" calendar on the Stream Team website at mostreamteam.org/ and join in the fun. We'll see you on the river!

Missouri Stream Team is sponsored by the Missouri departments of Natural Resources and Conservation, and the Conservation Federation of Missouri.

330 Acres Acquired Near Current River State Park

In November 2013, Missouri State Parks announced that the state has acquired 330 acres of property in Shannon County. The property, historically referred to as Camp Zoe, is located adjacent to Current River State Park and downstream from Montauk State Park. It also abuts the 64,000-acre Roger Pryor Pioneer Backcountry, which is managed by Missouri State Parks.

"This Ozark gem showcases beautiful natural resources, including Sinking Creek near its confluence with the Current River," said Bill Bryan, director of Missouri State Parks. "Its location near Current River State Park and minutes away from the beloved Montauk State Park will provide visitors great opportunities to enhance their Missouri State Parks experience in the Ozarks," Bryan added.

Plans for development of the property and future use are in the preliminary stages.

For news releases on the Web, visit dnr.mo.gov/newsrel.

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at dnr.mo.gov/calendar/search.do.

Looking for a job in natural resources? Go to dnr.mo.gov/hr.

Top Spots ... to Spend the Night

MISSOURI STATE PARKS

Missouri State Parks – a division of the Missouri Department of Natural Resources

Missouri State Parks offers 40 campgrounds, and many parks have traditional cabins, but there is an additional experience available for park visitors to enjoy alternative lodging that is economical and comfortable.

Camper cabins, which are a compromise between a housekeeping cabin and camping, are available at four state parks. Johnson's Shut-Ins and Mark Twain state parks have six camper cabins, Stockton State Park has five and Lake Wappapello State Park has four. Lake of the Ozarks State Park also has eight Outpost Cabins, which are similar.

The camper cabins have electricity, heating and air conditioning, but do not include water or restrooms. A central shower house and restrooms are a short walk away.

Lake of the Ozarks and Pomme de Terre state parks both offer yurts for rent. Yurts are a cross between a tent and a traditional cabin or RV camper. A durable fabric is stretched over a wood frame that includes a lattice wall and rafters that resemble spokes. The structure has a wood floor and is fastened to a railed deck that sits on top of concrete footings.

The yurt has a front door that locks, and three mesh screened windows that can seal shut with clear vinyl framed in Velcro. The yurt has electricity, air conditioning and heat, a small refrigerator and a microwave. The furnishings include a log futon, futon bunk bed and coffee table. A concrete pad out front has parking space, a picnic table, pedestal grill, fire ring and lantern post. There is no running water, and guests bring their own linens and coffee maker.

Reservations for camping, camper cabins or yurts at state parks can be made online at mostateparks.com, or by calling 877-ICampMo (877-422-6766).

A. Johnson's Shut-Ins State Park offers six camper cabins that feature exterior amenities such as a campfire grill, providing the opportunity to enjoy s'mores right at your doorstep. DNR photo by Scott Myers.

B-C. Six camper cabins at Mark Twain State Park are located in the park's Puma Campground. The wooded setting and lake views provide the perfect getaway for a quiet weekend or a week-long vacation. DNR photos by Scott Myers.

D. Pomme de Terre State Park is the latest to offer yurts as an alternative camping experience. DNR photo by Tom Uhlenbrock.

E. Yurts are circular structures with fabric covers, much like a tent. The wooden frame makes it strong and weather-tight. DNR photo by Scott Myers.

Paddlers along the Stockton State Park Water Trail enjoy a day exploring the shoreline of Stockton Lake. The 6.65-mile trail offers views of limestone bluffs and wildlife such as beavers and bald eagles.

STOCKTON STATE PARK WATER TRAIL

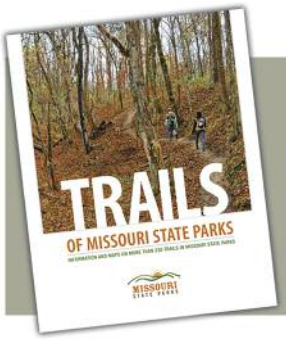
photographs by Scott Myers

Hikers, bicyclists and other trail users typically think of trails being on land, but Stockton State Park's newest trail provides the opportunity to experience the park on the water.

The water trail follows the shoreline of Stockton State Park and provides an opportunity to enjoy the park and Stockton Lake from a canoe or kayak. Along the 6.65-mile trail, paddlers will see limestone bluffs cut by the Little Sac and Big Sac rivers and wildlife such as bald eagles and beavers. While on the trail, fishermen may be tempted by largemouth, spotted and smallmouth bass, crappie, walleye, catfish and bluegill. Green fish habitat signs indicate underwater fish structures for great fishing opportunities. The trail provides access to quiet coves for lunch and an island for exploring.

The two trailheads are only a little more than a mile apart by road and bicycle racks are located at each trailhead for easy bicycle shuttling. Kayaks are available for rent at Stockton State Park Marina.

Stockton State Park Water Trail is one of three in Missouri State Parks. Paddlers also can enjoy a water adventure at Finger Lakes and Lake of the Ozarks state parks.



For more information on trails in Missouri's state parks and historic sites, get your copy of *Trails of Missouri State Parks*. The 422-page, spiral-bound book is a comprehensive guide to more than 230 trails with detailed information for each trail including descriptions, maps and GPS coordinates.

MISSOURI STATE PARKS

Missouri State Parks – a division of the Missouri Department of Natural Resources

Rock Matters

Chert

Chert is sedimentary rock composed of silicon dioxide (SiO_2). It is a granular microcrystalline form of quartz that is harder than glass, brittle, and breaks with a smooth, rounded or clam-like (conchoidal) fracture with sharp edges.

(Left) Rounded balls of chert are often referred to as cannonball chert. Cannonball chert forms inside of soft sedimentary rocks which later weather away.
(Bottom) Chert is a good material for arrowheads and other pointed tools, like this arrowhead knapped by MGS geologist Pat Mulvany Ph.D. Chert forms a sharp edge when chipped.
DNR photos by Hylan Beydler.

Chert colors may range from buff, green, gray or blue to red, pink, yellow, brown or black. A banded mixture of several colors also is very common. Because it is highly resistant to weathering, chert is the chief constituent of natural stream gravels in Missouri. The loose rock fragments blanketing hillsides in many parts of the state, particularly in the Ozarks, are mostly made of chert.

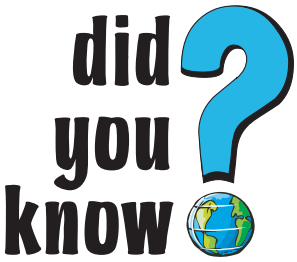
Chert is a rock of many names and disguises. Few people other than geologists actually call it chert, which is generally applied to the stone when its color is white, tan or light gray. Red, brown, reddish-brown and yellowish-brown varieties are called jasper. Black and dark gray specimens are known as flint. Mottled and pink types are called Mozarkite, while some banded varieties have found a home in the agate family. Staff geologists field numerous inquiries from citizens who believe they have found dinosaur or other bones, which in fact are chert specimens.

Gravel operations often excavate chert from Ozark streams and crush it for use as an aggregate in road construction. For Native Americans, it was the stone's hardness and the way it broke that made it invaluable. They used chert to make arrowheads and scraping and cutting tools because it breaks with a curved or shell-like fracture, leaving edges as sharp as broken glass. Artifact collectors generally call the stone flint.

Because chert is a very hard material that produces a spark when it is struck against steel, 17th-century-era long-barreled muskets used varieties of natural flint for their strikers. Modern-day Americans who make flaked stone tools like arrowheads and spear points are known as flint knappers.

The department's Missouri Geological Survey proudly displays an impressive collection of Native American stone artifacts at the survey's offices in Rolla. The more than 200-piece collection includes spear, dart and arrow points, knives, scrapers, drills and adzes. The artifacts are displayed in an archeological manner that chronicles man's dependence on industrial minerals. Industrial minerals are the nonmetallic, mined commodities that promote development and sustainment of civilization. This extraordinary collection was donated in 2002 by Estell Darwin Halmich of Bourbon, Mo.

Each year, hundreds of school children and adults are treated to this fascinating arrowhead display. In addition to this collection, numerous other instructive exhibits of rocks, minerals, fossils and maps are on display at the Edward L. Clark Museum of Geology, also in Rolla at 111 Fairgrounds Road. Learn more about chert at dnr.mo.gov/pubs/pub661.pdf.



Consumer Electronics Make Up 1 to 2 Percent of Municipal Solid Waste

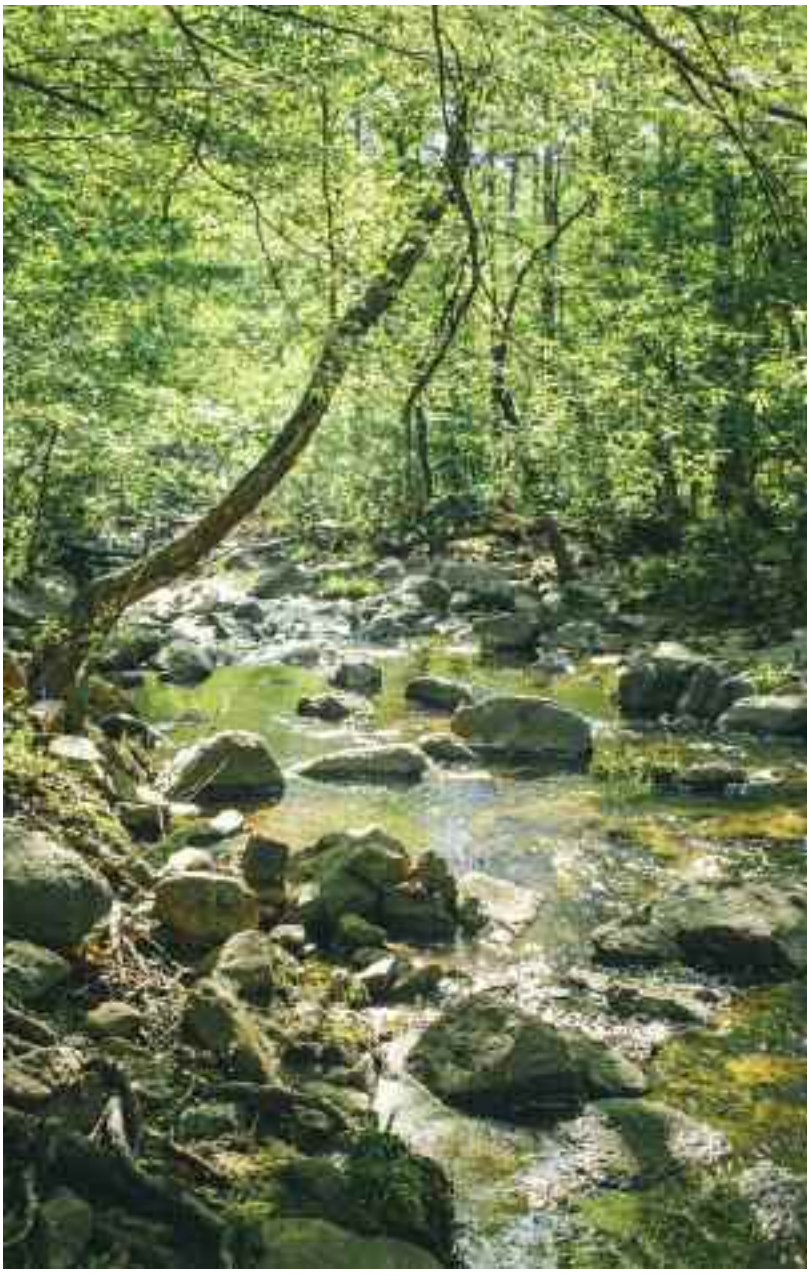
Did you know that consumer electronics make up approximately 1 to 2 percent of the municipal solid waste stream? Televisions, video equipment, computers, audio equipment and mobile phones may not only contain components that are hazardous to the environment, but they often require scarce materials and large amounts of energy to produce. In 2009, 215 million units of computers, televisions and mobile devices were ready for end-of-life management. Of these, only 38 percent of computers, 17 percent of televisions, and 11.7 percent of mobile phones were collected for recycling, according to a U.S. Environmental Protection Agency report. If just mobile phones were recycled, 35 thousand pounds of copper, 772 pounds of silver, 75 pounds of gold, and 33 pounds of palladium could be recovered for every million devices that passed through the recovery process. In addition, many electronics contain recoverable rare earth elements that are used for semiconductors and other components contained in the devices.

Recycling your electronics is not an impossible undertaking. Many electronics retailers have take-back programs for old items. In addition, many city, county and solid waste management districts host collection events for old devices, as well as events hosted by Missouri's e-cycle program. For more information on how and where to recycle your old electronics, visit the department's e-cycle website at dnr.mo.gov/ecyclemo.

MissouriDNR40 Photo Contest

Celebrating 40 years of taking care of Missouri's natural resources

by Renee Bungart
photograph by Scott Myers



Attention all shutterbugs and nature lovers! We would love for you to help us, the Missouri Department of Natural Resources, celebrate our 40th anniversary by capturing and submitting your winning photograph of Missouri's outstanding natural resources. In honor of our 40th anniversary, the department is hosting the MissouriDNR40 Photo Contest from March 1 through Aug. 1, 2014.

Missourians value clean air, water, soils and a healthy outdoors in which to recreate. We've heard this many times from our Missouri Resources readers and visitors to our Missouri state parks. With your help, we have been taking care of and preserving Missouri's natural and cultural resources including our air, land and water for 40 years. The MissouriDNR40 Photo Contest will offer you the opportunity to capture your favorite moments in Missouri's rich natural and cultural resources and share them for all to enjoy. The photo contest is divided into three categories.

- **Natural Resources:** this category includes photographs of Missouri's air, landscapes and waterways.
- **Special Places:** this category will feature photographs taken within one of Missouri's 87 state parks and historic sites.
- **People and the environment:** this category includes photographs of people enjoying Missouri's natural and cultural resources.

The contest is open to all amateur photographers with no age restrictions. You may submit two photographs per category with a maximum of six total entries, but do not submit duplicate photos in multiple categories. All photographs must be taken in Missouri and documented with the photographers name, contact information, photo caption and address or location for each photo. Photos may be submitted online through the department's website at dnr.mo.gov/40/photocontest or sent by mail to MissouriDNR Photo Contest, PO Box 176, Jefferson City, MO 65102. If selected as a semifinalist, you will be requested to submit a high-resolution electronic file. Contest winners will have their winning photographs featured in the Winter 2015 issue of *Missouri Resources* magazine, promoted on the department's website at dnr.mo.gov, displayed in the Lewis and Clark State Office Building, and showcased throughout the department. For a complete list of rules and entry form, visit dnr.mo.gov/40/photocontest.

So, grab your camera, capture the moment and submit your entries! Thank you for helping celebrate 40 years of taking care of Missouri's natural resources. Best of luck!

Renee Bungart is Deputy Director of Communications for the Missouri Department of Natural Resources.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
PO Box 176
Jefferson City, MO 65102-0176

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